ANDROID BASED DYSLEXIA EARLY SCREENING TEST

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DECLARATION

I declare that this project entitled "Android Based Dyslexia Early Screening Test" is the result of my own research except as cited in the references. The project has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : ……..

Name : ……..

Date : ……..……

APPROVAL

I hereby declare that I have read this project and in my opinion this thesis is sufficient in term of scope and quality for the award of Master of Computer Science (Multimedia Computing).

Signature	:	……..
Supervisor Name	:	……..
Date	:	……..……

DEDICATION

I lovingly dedicate my thesis to my beloved husband Muhammad Zidhuan bin Abd Rahman who supported me each me step way,

To my lovely and precious daughter and son, Nur Batrisyia Izzati and Muhammad Izzat Zuhair who give me passion and strength with their smile and understanding,

Unforgetable to my parents Abu Zarim and Azizah who always pray for my success.

All of you are the most precious gift from ALLAH.

ABSTRACT

Dyslexia is one of the learning disabilities which cannot be identify through physical appearance but need a specific assessment. Parents are not aware about the symptoms until the clinical assessment is carried out. In order to encourage parents to detect the symptoms in the early age, an android based dyslexia early symptom test is designed. The application is simple to use, easy to understand, enjoyable and can motivate children. The test comprise on visual test. It can be apply via smartphone, iPad or tablet. Parents can easily download the application from internet and conduct the test on their children. It will provide immediate score. Thus, parents can bring their children to psychologist for further diagnose and remediation. This is only a first step for parents and school teachers to detect the risks of dyslexia symptom which is very important when children start schooling.

ABSTRAK

Disleksia adalah merupakan salah satu masalah pembelajaran yang tidak boleh di kesan secara fizikal tetapi boleh dikesan melalui penilaian yang spesifik. Ibu bapa hanya menyedari simptom disleksia dikalangan anak-anak setelah dimaklumkan oleh pihak sekolah dan juga selepas ujian klinikal dijalankan. Justeru itu, satu aplikasi ujian pengesanan awal simptom disleksia dibangunkan bertujuan untuk memberi kesedaran kepada ibu bapa untuk mengesan risiko simptom disleksia di peringkat awal. Aplikasi ini dibangunkan berasaskan teknologi android dan merupakan aplikasi yang ringkas dan mudah digunakan, mudah difahami, tidak membosankan dan boleh menarik minat kanak-kanak. Ujian adalah dalam bentuk visual dan boleh digunakan menggunakan aplikasi telefon pintar, IPad dan juga tablet. Ibu bapa boleh memuat turun aplikasi melalui internet. Aplikasi ini akan memberikan keputusan segera berdasarkan skor yang diperolehi. Seterusnya, ibu bapa perlu membawa kanak-kanak berjumpa pakar psikologi untuk menjalani ujian berbentuk klinikal bagi tujuan pengesahan. Ini adalah merupakan langkah pertama bagi ibu bapa dan juga guru sekolah untuk mengesan risiko simptom disleksia ketika kanak-kanak tersebut memasuki alam persekolahan.

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INTRODUCTION

1.1 Background

On 1st January 2012, the government started to begin the transformation process in the effort towards the efficiency of its delivery system. The transformation process is based on National Key Result Areas (NKRA) Education which focus on four (4) sub-NKR towards quality and affordable education. One of the sub-NKRA is Literacy and Numeracy or also known as LINUS. The NKRA stated that basic literacy and numeracy skills must be mastered by each children after three (3) years of primary schooling at the end of year 2012.

LINUS was introduced by the Ministry Of Education to overcome children with learning difficulties. It goes after PROTIM was launch in 2007. Linus focus on seven (7) to nine (9) years old school children as PROTIM focus on ten (10) to twelve (12) years old. Linus is based on the lower level of education and have the same flow as the "Kurikulum Standard Sekolah Rendah" or KSSR. Literacy refers to the ability to read, write and understand words, simple single and plural sentence. Numeracy is defined as the ability to perform basic mathematical operation and understanding simple mathematical idea and apply the knowledge and skills in daily life.

Justifications on why some children haven't mastered certain skills need to be done. Otherwise, the children can be classified as children with special needs. Children

with special needs is defined as student with learning problem, hearing problem, speaking problem, eyesight problem, spastic, multiple disability and physical disability. Thus, special literacy

and numeracy curriculum was design and developed for children with special needs. According to Nazariyah Sani & Abdul Rahman Idris (2012), one of the factor that caused the students failed to master literacy is because of learning difficulty which teachers could not identified. One factor of the learning problem is caused by dyslexia. This is also supported by Handler et al. (2011) which stated the most common learning disability is caused by reading difficulties or dyslexia.

This research is focusing on assisting parents to detect whether their children is dyslexia in the early age. The difficulties of each dyslexic is different whereas some of them are good in art and some of them are verbally bright or in the other word they have their own set of difficulties. With early detection and appropriate help, most of them are able to learn to read and write well enough to become successful students and even able to further studies to the upper level. In order to engaged the dyslexic children and as an early preparation for year 1 of their schooling, parents need to know their children capability to learn.

Dyslexia is defined as one of learning disability that attacks children and adult. It is not a disease but it is just a barrier in children's learning process. The word dyslexia originates from a Greek word and was introduced by Prof. Rudolf Berlin (specialist and opthamologist) in 1887. It was used to describe when smart people find it difficult to read. This kind of learning disability happen in children without physical or psychological problems. They are physically normal like others but their brain is having a problem within the language system. (Shaywitz & Shaywitz 2004) identified the neural system used in reading which consist of three regions located on the left side of the brain. Lyon, G Reid,

Shaywitz, Sally E (2003) states that, dyslexia is a specific learning disability that is neurobiological. It is characterized by difficulties with accurate and fluent word recognition and by poor spelling and decoding abilities. Hudson, Roxanne, Leslie and Stephanie (2007) said dyslexia is a language-processing systems disorder in the brain. It is a specific learning disability in reading that often affects spelling as well. A dyslexic can be group into mild, moderate and severely. One dyslexic are able to read quite well, but find it difficult to learn spelling or unable to express ideas clearly. Another may have a problem with reading, but verbally bright. There are a few general symptoms that can be easily noticed. For examples:

1. Difficult to write. They are unable to grip the pencil perfectly. Have bad handwriting and illegible.
2. Always do repetitions, additions, transpositions, omissions, substitutions, and reversals in letters, numbers and/or words while reading or writing.
3. Spells phonetically and inconsistently.
4. Confused by letters, numbers, words, sequences, or verbal explanations.

In helping children who may have this kind of learning difficulties, a research need to be carried out to help them in the early age. Dyslexia can be treated and need to treat early before it could get serious and effect the children's life. Everyone have their own role in helping these children from parents to teachers and also schools' administrators.

1.2 Problem Statement

Physical disability such as eyesight problem, hearing problem or spastic can be easily to determine. Most parents were not aware of dyslexia symptom because of the physical and child growth was usually normal with others. Parents might think their children is a slow learner compared to other children on their age and accepted it as a normal situation. School teachers and parents also does not acquired skill to detect symptoms of dyslexia and also there is no early screening conducted in the preschool level. Currently, screening began in the first year of schooling. Parents only assumed their children as slow leaner but they wouldn't know either the children possess other learning difficulties.

In Malaysia, the LINUS program is implemented to screen reading and writing skills on level 1 student (standard one (1) to standard three (3)). Student who are not be able to master certain skills will be separated into recovery class. However, after three (3) years of schooling, there are still a number of students who cannot master the literacy skills. This problem really affect the learning process when the student's are unable to understand, answer questions correctly and even write properly when they continue to level 2 (standard four (4) to six (6)).

It is therefore believed that dyslexic screening in Malaysia is to be conducted sooner. The general question that has been raised is, why most Malaysian children diagnosed to have dyslexia after start schooling? Statistics shows about 314,000 school-going children in Malaysia was diagnosed as dyslexia. We should detect the symptoms of dyslexia before entering primary school, so that parents can engaged and school teachers can develop intervention program for these children as an early preparation. This might save time where

primary school already prepared and focus the appropriate education system to cater them without delaying the three (3) years of schooling.

1.3 Research Objectives

This research is significantly to achieve these objectives which are:

1. To study the screening tools of dyslexia symptom.
2. To develop android based application for dyslexia early screening test.
3. To evaluate the effectiveness of the application.

1.4 Research Questions

A questions need to be answered in this research are ;

1. What kind of screening tool available to identify dyslexia symptoms on children in early age?
2. What kind of tool/platform suitable to be use to let parents or teachers identify the dyslexia symptoms on the children?
3. What kind of test is suitable to be conduct on children in early age?
4. Is the proposed application suitable to be implement to detect dyslexia symptoms on children in early age?

1.5 Research Significant

This research will help parents and teachers to identify the risks of dyslexia symptoms on the children in the early age. It will help to cater the children needs at the early stage. Most of dyslexic people who are not provided with an appropriate treatment become frustrated and facing emotional problems like depression and demotivated. This study also helps parents to prepare their children who possesses dyslexia to be more confidence.

For school, this study may help them to devise a suitable intervention program for the dyslexic children. It also act as the first step in a 'response to intervention' approach to diagnosis and remediation.

1.6 Research Scope

The scope of this research is going to focus on children age five (5) to ten (10) years old in Batu Pahat, Johor. The test items comprises a visual test. It will only measure cognitive abilities on the children.

1.7 Summary

This application will be used by parents and teachers as an early screening and is not presenting a clinical test. It is only a first step for parents and teachers to engage possible risks of dyslexia symptom possess by the children. It takes the advantages of current mobile technology which parents are able to download the application via internet such as App Store. In the next chapter we will investigate the screening tools used to identify dyslexia symptoms.

CHAPTER 2

LITERATURE STUDY

2.1 Introduction

The number of children diagnosed as dyslexic in Malaysia is quite critical. According to the Ministry of Education, there are about 314,000 school-going children in Malaysia was diagnosed as dyslexia. This fact is supported based on the statistics from previous reseachers. Musa Abdul Wahab (2002), has reported on his study among 153 pupils recovery in Pudu Zone Federal Territory found 36.3% of them had a problem at the level of serious dyslexia. While individual students who are struggling dyslexia at the average level is 30.2% and 33.5% were mild. The study is focused specifically on the problem of reading, writing and arithmetic skills among pupils in a recovery class. Next, Mohd.Majzub & Mohd. Nor (2005) have stated their finding which shows 27.5% (11 students) of the preschoolers had dyslexic symptoms and 15% (6 students) were identified as dyslexic at the high risk level. The experiment was conducted with 40 samples of preschoolers. Follow by Ramasamy (2008), also conducted a study with 120 respondents. The findings shows 91 people or 75.8% of students was found included in the category of individuals who have a high risk of dyslexia, 26 people (22.7%) were categorized as moderate and 3 students or 2.5% belong to the category of low level. The statistics indicated that an urgent action need to be taken to cater this problem. The Ministry of Education in particular have to perform immediate action in screening and designing the best education system to ensure dyslexia children receive appropriate education.

2.2 Dyslexia characteristics

Children who experienced the characteristics of dyslexia have low reading skills, often read and write words and letters according to the arrangement upside down and inverting the words or letters when speaking. They are said to have a low verbal understanding, love to read silently and have bad handwriting. It is difficult to them to recognize math symbols or sign and they have a problems in employment numbers. They are also unable to match sounds with symbols and will also drop certain syllables of words-syllables. According to (Anon n.d.) Dyslexia Association of Malaysia (DAM), President Sariah Amirin said that 80% of children with dyslexia have a difficulty in reading. Some of them are able to read but cannot understand about what they have read because of poor short term memory or understanding. Peterson & Pennington (2012) was reported in his study, dyslexia is a neurodevelopmental disorder that is characterized by slow and inaccurate word recognition. Vijayaletchumi, Shamsilah Roslan, Yong Chyn Chye (2013) said that dyslexic children have talent and specialty in arts because they are identified as having the inclination towards using their right side of the brain compared to the left. The usage of the right brain has the association with emotion, face recognition and determining the object structure. Therefore, the way these children think is usually different from the normal ones. Hence, we can conclude that dyslexic is a learning difficulties on reading, writing and spelling.

2.3 Dyslexia screening tools

In the early study on screening of dyslexia symptoms, the prediction focused on language and reading. But nowadays, the prediction also cover other cognitive and psychomotor evaluation such as auditory processing, visual motion processing, visual spatial attention and motor control. Positive indicators was used rather than exclusionary criteria as early attempt to device dyslexia screening test.

Fawcett, Nicolson and Groner (1993) designed a study to develop a dyslexia screening test administered to preschool children. They desired an accurate screening to provide the best definition of dyslexia prediction. At the end of the study, writers provided a list of major category of tests used to predict dyslexia symptoms as Table 1 (see *Table 1*).

Table 1 : Major categories of dyslexia screening test

Test	Type	Reference	Method
Psychometric Test	Tests B.P.V.S.	Dunn, Dunn and Whetton (1982)	Paper
	British Ability Scales (10 sub-scales) Predictive	Elliott, Murray and Pearson (1978)	Paper
Predictive Tests	Left-Right confusions	Bangor Dyslexia Test	Paper
	Finger Localisation	Benton (1959)	Paper
Phonological/Memory skills	Non Word Repetition	COMB[2]	Mac
	Phonological Discrimination	COMB[3]	Mac
	Rhyming task	COMB	Mac
	Prepositions		Verbal
	Word Segmentation		Verbal
Motor skills and automaticity	Articulation rate	COMB	Mac
	Beads task		Beads
	Draw - a- person	Koppitz (1968)	Pencil

	Pegboard Task	Annete (1970)	Board
	Blind fold balance		Motor
Information Processing speed	Visual Search		Paper
	Simple reaction	COMB	Mac
	Choice reaction	COMB	Mac
	Lexical Access	COMB	Mac
	Naming	COMB	Mac

Writers experimented all the batteries above and analyze the result using stepwise regression and discriminant function techniques to identify which items of the battery were the best 'predictors' of dyslexia and those which were the best 'predictors' of non-dyslexic backward reading. However, it is quite complex to design an accurate definition of dyslexia prediction which consist all the possible tests as mentioned above. Up to now, researchers are still arguing about the best definition to predict dyslexia symptoms.

In 1995, a Dyslexia Early Screening Test (DEST) is developed by (Fawcett & Nicolson, 1995) based on their previous study. There are eleven (11) subtests which covered speed, phonological skill, motor skill, cerebellar function and knowledge. This test provide an overall 'at risk' judgement, together with an ability profile that indicates the particular parts of difficulty. It has been designed and to be administered by teachers or health professionals without specific training in psychological testing. It is only a 30 minutes test for the children to complete it. Previously, there are many other conventional approaches used to assess cognitive abilities such as listed in Table 2 (See Table 2).

Table 2 : Previous conventional assessment for cognitive assessment

Assessment	Author	Method	Age (years)
British Ability Scales Word Reading Test (BAS Word Reading)	Elliot, 1992	• Perform by individually • Reading out-of-context of oral single word	5 yrs – 14 yrs 4 mths
British Picture Vocabulary Scale (BPVS)	Dunn, Dunn and Whetton, 1982	• Perform individually • Based on receptive vocabulary. The participant has to select a picture from four pictures given. The selected picture must be the most appropriate with a given spoken word by the test's administrator.	2 yrs 11 mths – 18 yrs 1 mth
Edinburgh Reading Test, Stage 1	(Godfrey Thompson Unit, 1993).	• Perform by group • A silent reading test. Consist of mixture items of single word recognition, vocabulary of reading and sentences comprehension and use of context in reading longer passages. • The scores of vocabulary, syntax, sequences and comprehension are provided separately.	7 yrs – 9 yrs
Macmillan Individual Reading Analysis (MIRA)	(Vincent and De La Mare, 1989)	• Perform individually • Oral reading test of short prose passages	5 years 6 months – 10 years
Matrix Analogies	(Naglieri, 1985)	• Perform by group	5 years– 17